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## **REPORT**

on aquaculture in the European Union: present and future  
(2002/2058(INI))

Committee on Fisheries

Rapporteur: Hugues Martin



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## PROCEDURAL PAGE

At the sitting of 16 May 2002 the President of Parliament announced that the Committee on Fisheries had been authorised to draw up an own-initiative report, pursuant to Rule 163 of the Rules of Procedure, on aquaculture in the European Union: present and future, and that the Committee on the Environment, Public Health and Consumer Policy had been asked for its opinion.

The Committee on Fisheries appointed Hugues Martin rapporteur at its meeting of 13 March 2002.

It considered the draft report at its meetings of 12 November and 10 December 2002.

At the latter meeting it adopted the motion for a resolution unanimously.

The following were present for the vote: Struan Stevenson, chairman; Rosa Miguélez Ramos, vice-chairman; Brigitte Langenhagen, vice-chairman; Hugues Martin, vice-chairman and rapporteur; Gordon J. Adam (for Heinz Kindermann), Elspeth Attwooll, Arlindo Cunha, Salvador Jové Peres, Carlos Lage, Vincenzo Lavarra, Giorgio Lisi, Albert Jan Maat, Ioannis Marinos, Manuel Pérez Álvarez, Catherine Stihler, Daniel Varela Suanzes-Carpegna and Herman Vermeer (for Niels Busk).

The opinion of the Committee on the Environment, Public Health and Consumer Policy is attached.

The report was tabled on 10 December 2002.

## MOTION FOR A RESOLUTION

### **European Parliament resolution on aquaculture in the European Union: present and future (2002/2058(INI))**

*The European Parliament,*

- having regard to the communication from the Commission to the Council and the European Parliament on a strategy for the sustainable development of European aquaculture of 19 September 2002 (COM(2002) 511),
  - having regard to the communication from the Commission on a European Union Strategy for Sustainable Development (COM(2001) 264),
  - having regard to the meeting of the FAO subcommittee on aquaculture in Beijing, China, from 18 to 22 April 2002,
  - having regard to the work programme and the outcome of the visits made by the rapporteur,
  - having heard the representatives of and experts on the aquaculture sector at the public hearing held by the Committee on Fisheries on 1 October 2002,
  - having regard to Rule 163 of its Rules of Procedure,
  - having regard to the report of the Committee on Fisheries and the opinion of the Committee on the Environment, Public Health and Consumer Policy (A5-0448/2002),
- A. whereas marine aquaculture (comprising the farming of fish, molluscs and crustaceans) and inland aquaculture present different business realities that are an integral part of the CFP and aquaculture is a complement to and not a substitute for the fisheries sector,
- B. whereas aquaculture as a whole must be directed towards the principle of sustainable development,
- C. whereas aquaculture helps to maintain and develop employment in inland and coastal areas,
- D. whereas aquaculture is an important response to the growing demand for fish and the protection of fish stocks,
- E. whereas aquaculture may represent an important source of additional income for fishermen, who can thus reduce their fishing activities and lessen the impact of such activities on resources,
- F. whereas the term aquaculture covers the farming of species which vary widely as regards both their current economic situation and their prospects for development, which makes it vital to conduct an individual analysis of each market to reach a correct diagnosis of the situation of and prospects for each species and take appropriate measures to promote it,

- G. having regard to the substantial research needs of the aquaculture sector in many areas and the inadequacy of the funds allocated for this purpose,
- H. whereas it is necessary to re-stock species that are declining in rivers and certain species of sea fish,
- I. whereas fish farming, like any other industry, has an impact on the environment, which is mitigated by Community regulations,
- J. having regard to the rules governing the introduction of alien species,
- K. whereas the many technical, environmental and health requirements applying to the aquaculture sector and ensuring food safety raise a number of problems, particularly for small and medium-sized businesses,
- L. whereas increasingly stringent environmental regulations and the precautionary principle mean that licensing procedures are more and more strict,
- M. whereas, on the one hand, industrial fishing may have a serious impact on fish stocks and, on the other, fish farming could experience supply problems relating to fish feed,
- N. whereas there is genuine competition for space and fish farmers have the same rights and duties as other users,
- O. whereas the Commission decided on 26 April 2000 that aquaculture was not eligible under the rural development regulation and there is nothing in the current FIG to replace the subsidies previously received,
- P. whereas the Commission, as guardian of the Treaties, is responsible for ensuring free competition on the market and preventing unfair competitive practices in the form of the loss-making sales which are currently occurring in some sectors of aquaculture,
- Q. whereas imported products and those from the applicant countries must satisfy the same requirements as European products,
- R. whereas the criteria for recognising aquaculture producers' organisations need to be adapted,
- S. whereas the policy of strengthening the development of new farming installations, such as those for turbot, pursued until now through the FIG Regulation, has been a success even though it remains insufficient measured against the growth in demand,
- T. whereas tests for detecting toxins are not sufficiently precise and systems for measuring toxins have not been sufficiently standardised at European level, and because excessive precautions are sometimes taken this results in longer harvesting and marketing bans, which can threaten the survival of the most vulnerable farms, and significantly restrict the development of production activities, especially as regards farming of marine bivalve molluscs,

- U. whereas the aquaculture sector sometimes suffers from a negative public image often due to lack of knowledge of farming conditions,
1. Calls on the Commission to step up research in all areas of aquaculture without exception, and calls on the Member States also to continue allocating sufficient funds for research;
  2. Supports the Commission's initiative of revising existing legislation on food safety, public health and animal health, by simplifying it and introducing coherent Community rules;
  3. Recognises that certain types of intensive aquaculture may pose problems for animal health and welfare, particularly from over-crowding, and that new methods need to be found to provide more space for the fish;
  4. Calls on the Commission to encourage the adoption of farming practices which respect the welfare of the fish and to propose regulations to safeguard fish welfare which should, in particular, consider stocking densities and prohibit inhumane slaughter methods;
  5. Calls on the Commission to take into account the economic importance of all businesses, including the smallest, so that they are all able to satisfy technical and environmental requirements, which entails concerted adjustment of a development policy and of health regulations specific to each type of product;
  6. Calls for protection for traditional practices such as aquaculture in estuaries, which should at the same time be made subject to specific controls which take account of the environment in which they are conducted, which generally consists of mud flats and natural sites;
  7. Calls for the FIFG regulation to be amended so that aquaculture is eligible for subsidies for young people's start-up, modernisation and transfer of farms, particularly for species where growth is continuing smoothly, cofinancing of subsidies for the adoption of environmentally-sound farming practices, and for all forms of production to be eligible, including the restocking of rivers;
  8. Supports the development of new technologies for fish-farming such as intensive water recycling systems and marine offshore fish-breeding;
  9. Calls on the Commission to encourage research into the problems of escapees, transgenic fish, and alien species, and to bring forward proposals concerning the introduction of the latter into the environment;
  10. Is alarmed with the recent development of genetically modified salmon in North America; any attempts to introduce genetically modified fish into the Community should be prevented until such time as it can be demonstrated to present no dangers for consumers or the environment; it is noteworthy that the Federation of European Aquaculture Producers (FEAP) has rejected the proposal to produce genetically modified fish;
  11. Is concerned that salmon from fishfarms can affect natural fish populations, primarily genetically; notes, however, that work is in progress to minimise the risk, which has also resulted in an appreciable reduction in the number of escaped fish;

12. Calls on Commission to undertake a feasibility study on the creation of a data bank and the conservation of genetic stocks of wild fish;
13. Calls on the Commission to provide a report on the welfare of farmed fish from its Scientific Committee on Animal Health and Welfare, and for the recommendations from such a report to form the basis of a future directive on the welfare of farmed fish;
14. Calls on the Commission to carry out a detailed study of the impact of triploid oysters on their environment and to consider the confinement of tetraploid mother oyster strains in suitable onshore structures if there is evidence that the current situation poses a real danger;
15. Calls for the Commission to intervene to resolve problems affecting the market for certain species, particularly sea bream and bass, stemming from practices involving loss-making sales on the part of certain firms;
16. Calls on the Commission to contribute to the development of physicochemical and biological techniques, harmonised at European level, which would permit the toxins concerned and their concentration in shellfish to be determined;
17. Considers that the positive trend in recent years towards reduced use of pharmaceuticals, chemicals and other artificial substances in aquaculture should be promoted and resources invested in the further prevention of diseases, securing favourable conditions for fish (reducing disease and the need to use substances for treatment) and developing alternative, environment-friendly substances for and methods of treatment;
18. Calls on the Commission to authorise the use within the European Union of any vaccine product that has been granted a marketing authorisation in one of the Member States;
19. Calls on the Commission to release funds for research into vaccines, in order to limit antibiotics, and for zootechnical research with a view to improving disease-resistant strains;
20. Supports the European Parliament and Council Recommendation that integrated plans or programmes for the management of coastal or rural areas, be devised and published, in order to resolve disputes with other users, particularly the tourism sector;
21. Proposes that resources should be invested in research and development to develop, test and bring into operation possible alternative production methods, and to assess any global environmental impact they may have compared with traditional technology;
22. Notes that only 35% of fishmeal is used for fish products, while the rest is used for other food production; aquaculture should, however, endeavour to reduce dependence on fish oil and fishmeal and invest in developing alternative raw materials but without abandoning high quality feed standards; at the same time, due care should be taken to ensure that fishing for the raw materials used in aquaculture is carried out in a sustainable manner;

23. Considers that research on fish feeding must be supported with a view to: on the one hand, securing the supply of raw materials and, on the other, guaranteeing product quality and food safety for consumers;
24. Calls on the Commission to develop research into the nutritional quality of farmed fish to allow the image of aquaculture products to be put across in an objective way;
25. Calls on the Commission to incorporate the search for new species of high quality and added value among its priorities for aquaculture, and to increase Community research and the exchange of best practice with regard to those species and methods of farming them, in order to improve the sector's competitive position vis-à-vis other novel foods;
26. Calls on the Commission to introduce a Code of Conduct that clearly defines best practice during the production of smoked fish, in particular, avoiding the use of smoke essence and dye combined with ultra-short smoking time and aiming to utilise the highest standards of welfare, quality and hygiene during the production process;
27. Urges the Council and the Commission to impose the same health, food safety and animal welfare standards on products from non-member countries to avoid unfair competition;
28. Calls on the Commission to equip the aquaculture sector with a real economic crisis instrument and to devise support systems for biological natural disasters (like toxic algal blooms) or man-made disasters (like the Erika or Prestige), while making sure that this does not become an operating subsidy;
29. Calls on the Member States to grant subsidies from the FIFG to develop new tools for compiling statistics on production and market trends;
30. Calls on the Member States to pay particular attention within the framework of the ESF and FIFG to training for occupations in the aquaculture sector and to recognise the role of women in that sector;
31. Calls for the Commission to promote aquaculture in the EU, essentially in coastal areas affected by significant restructuring, as is the case with those affected by the non-renewal of fisheries agreements with third countries, and in general in coastal and rural areas where there are no alternative activities;
32. Calls on the Commission to draw up new rules for the recognition of producers' organisations, adapted to the aquaculture sector;
33. Calls for arrangements to ensure the participation of all those working in the aquaculture sector as well as consumer associations and amenity groups;
34. Insists on the importance of aquaculture jobs at all levels, including at local level, and on its representativeness and coordination at European level and encourages the use of codes of conduct by the profession;
35. Suggests that the Commission, the Member States, trade and joint-trade organisations should together draw up a concerted communications programme to improve the image of the aquaculture sector among opinion formers, the distribution sector and consumers, to

inform the public better about the potential and benefits of the sector, calls for specific legislation to be incorporated in the FIG Regulation as regards promoting the quality of aquaculture products, including both designations of origin and campaigns to promote the consumption of this type of product, and emphasises that communication operations should present aquaculture products as non-GMO products;

36. Instructs its President to forward this resolution to the Council and Commission and the parliaments of the Member States.

## EXPLANATORY STATEMENT

### 1. Introduction

At the start of 2002, the European Parliament's Committee on Fisheries decided to draw up an own-initiative report on aquaculture in the European Union: present and future. This interest in aquaculture demonstrates the sector's growing importance. Over the past ten years, aquaculture has seen a rapid expansion in both the world as a whole and the European Community, and has become the sector of food production with the strongest growth (+11%).

The European Community accounts for 4.7% of world aquaculture in value terms, but is the chief world producer for most of the species farmed on its territory (trout, sea bass, sea bream, European eel, turbot, mussels and oysters). The aquaculture sector holds a significant share in the Community fishing industry with 1.8 million tonnes in 2000 (0.94 million tonnes in 1990) or 27% in value. European Community fish production has risen from around 125 000 tonnes in 1980 to 297 000 tonnes in 1990 and 522 000 tonnes in 2000. Although aquaculture complements fishing activities, it is a sector in its own right.

This report discusses the present situation and the challenges that European aquaculture will face and sets out a number of ideas on the direction that Community policy should take in the future.

### 2. Aquaculture sector in the European Union

Aquaculture is the farming of aquatic organisms, comprising fish, molluscs, crustaceans and aquatic plants. Trout, salmon, mussels and oysters are the main species, and the chief producing countries are France, with 265 800 tonnes (EUR 510 million), followed by Spain (233 700 tonnes, EUR 212 million) and Italy (212 000 tonnes, EUR 357 million). In terms of value, the United Kingdom stands in second place (EUR 384.5 million).

Community aquaculture is made up of three branches:

- The farming of sea fish, dominated by salmon in Scotland and Ireland, even though there has been a strong increase in the farming of sea bream and sea bass in the Mediterranean over the past decade (chiefly in Greece). Even though it occupies a minor role in terms of quantity, turbot is also significant because Spain and France account for the entire world production of this species.
- The saltwater farming of crustaceans and molluscs accounts for more than 80% of the volume of marine aquaculture. The main producers in the field of marine aquaculture (fish, crustaceans and molluscs) are Spain with 208 400 tonnes (notably mussel production in Galicia), France with 208 100 tonnes (notably oyster production), Italy with 158 000 tonnes (notably clams in the Adriatic) and the United Kingdom (113 400 tonnes).
- Freshwater aquaculture chiefly involves trout farming (the main species produced in terms of value, with EUR 500 million), the chief producers being France, Italy, Germany (carp) and Denmark.

The Community provides support for aquaculture facilities through:

- The framework programme for research and technological development (RTD)<sup>1</sup>, even though the bulk of RTD investment stems from the aquaculture industries themselves or from the Member States' own research programmes;
- The Financial Instrument for Fisheries Guidance (FIFG), which allocated EUR 280 million (11% of its budget) to aid for tangible investment between 1994 and 1999 (construction of production units and projects aimed at reducing the environmental impact, expanding production and improving productivity).

Advantages of aquaculture:

- Supplying the market with fish, crustaceans and molluscs and reducing the import/export imbalance for fishery products;
- Creating jobs (57 000 in all, and rising), as well as improving the socio-economic situation in many coastal and rural areas where there are generally no alternative activities.

### **3. Problems facing the aquaculture sector**

#### *Competition and the market*

Even though aquaculture has never experienced serious overproduction crises, it is affected by short-term disruption due in particular to inadequate marketing methods.

#### *Environment and consumers*

Aquaculture does have a real impact on the surrounding area, but it is regulated by some 150 Community regulations (20 of which are the most important), ensuring respect for the environment. Several problems arise:

- Environmental rules are increasingly stringent and procedures for granting licences are increasingly strict, frequently being based on application of the precautionary principle;
- Seawater and freshwater fish farming is under pressure from activities such as tourism; account must also be taken of concerns regarding the future availability of fish meal and fish oil and the discharge of waste into the water;
- The lack of precision in toxicity screening tests is leading to more numerous and lengthy bans on harvesting and marketing which may threaten the survival of the most vulnerable farms.

#### *Community funding*

On 26 April 2000 the Commission ruled that aquaculture was not eligible under the rural development regulation. Previously, the sector had been eligible for aid under the EAGGF (start-up aid, aid for the transfer of farms, co-financing for regional producers' agreements). The current FIFG regulation makes no provision for granting this type of aid.

#### *Communication*

Aquaculture suffers enormously from the negative public image of intensive farming conveyed by consumer and animal welfare associations, which protest at the abuse practised by intensive aquaculture and the use of antibiotics and consider aquaculture products to be of

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<sup>1</sup> The sixth Framework Programme for Research and Technological Development (RTD) has already been approved, which means that Community support for fisheries research is guaranteed beyond 2002.

insufficient quality in terms of their taste.

#### *Enlargement*

Enlargement brings with it two main dangers: competition and a reduction in the handouts available. However, the consequences should be put into perspective: the applicant countries are mainly producers of carp, the production of which is of marginal importance in the European Union.

#### **4. Communication from the Commission**

The Commission presented its communication on 19 September 2002. It can generally be seen as positive: the challenges described and proposals brought forward by the Commission reflect the current concerns of the sector fairly well. This communication fortunately breaks with line taken in the Green Paper, where the aquaculture sector came off very badly.

##### (a) Challenges and objectives

- **Boosting economic viability** and solving disputes on competition for space. The Commission intends to **create between 8 and 10 thousand jobs** in the long-term, particularly in regions dependent on fisheries, over the period 2003 to 2008, and to increase the growth rate for fish farming production to 4% a year;
- **Guaranteeing food safety and animal health** and promoting high standards for the health and welfare of animals;
- **Ensuring that the industry is environmentally friendly** by tackling environmental problems, mainly the effects of eutrophication, escapees and GMOs;
- **Stimulating research.**

##### (b) Proposals

The first series of proposals focuses on:

- Increasing **production** by refocusing the FIG's priorities, promoting research and developing new species and organic aquaculture;
- **Competition** for space, looking at the development of closed water recirculating systems, offshore fish cage technology, giving higher priority to mollusc farming and incorporating future aquaculture developments in Integrated Zone Strategies and Management Plans;
- Market **development** and **information**: this involves improving the image of the industry, and developing promotional campaigns and compiling better statistical information on production and market trends;
- **Training** designed to adapt training programmes to aquaculture needs and recognise the role of women and that of aquaculture in rural development.

A second series of measures focuses on the **safety** of aquaculture products and **protection of the environment**. Among the most important, there is the re-casting of Community legislation on food hygiene, more research on and control of harmful algal blooms and diseases, the updating and regular simplification of animal health legislation, mitigating the impact of waste discharges, and of escapees, alien species and GMOs, aquaculture Environmental Impact Assessments and recognising the positive impact of extensive farming and restocking.

**Research** is also a priority as the Commission wants to extend the possibilities of financing research and technological development;

Finally, the fourth and last aspect relates to governance, through further developing stakeholder participation and greater use of self-regulation and voluntary agreements.

## **5. Observations on the Commission's communication**

The communication from the Commission provides, at last, a pertinent analysis of problems in the fish farming sector. As can be seen from the proposals outlined above, it aims to achieve sustainable aquaculture, taking into account the need for economic viability, alongside conservation of the environment and continuing food safety, without forgetting the development of research.

Nevertheless, the communication fails to take adequate account of a number of factors:

### **Environment**

- (a) promoting integrated management plans for both coastal and inland areas.

### **Food safety**

- (a) health management programmes must take account of the restocking of inland waters and the harmonisation of management procedures for the transfer of live fish;
- (b) the instruments to be introduced might include a health certificate for each production site;
- (c) Community legislation on food hygiene should take account of the specific characteristics of each product or type of production.

### **Research**

- (a) aquaculture businesses should be eligible for assistance through Community and national research programmes;
- (b) greater financial incentives are required for research and development into new vaccines to eradicate the risks linked to the use of antibiotics;
- (c) to pave the way for Community recommendations or regulations ensuring the welfare of farmed fish, it is vital that research should be undertaken with a view to defining objective criteria.

## **The market and funding**

It is necessary to:

- (a) amend the FIFG regulation to allow subsidies to be granted for the start-up or transfer of farms and co-financing of subsidies for the adoption of more environmentally-sound farming practices;
- (b) define rules for the organisation of specific markets in the aquaculture sector and, in particular, the criteria governing the rules for recognition of producers' organisations (number of members, economic importance compared to national production, recognition thresholds), as at present the rules are derived from those for producers' organisations in the fisheries sector and are ill-suited to fish farming;
- (c) encourage trade and joint-trade organisations to undertake programmes to improve market management;
- (d) in order to prevent distortions of competition, define procedures for the establishment of production sites and the granting of operating licences in Europe and ensure that any vaccine that has a marketing authorisation in one of the Member States has its authorisation extended to the Union as a whole.

28 November 2002

## **OPINION OF THE COMMITTEE ON THE ENVIRONMENT, PUBLIC HEALTH AND CONSUMER POLICY**

for the Committee on Fisheries

on aquaculture in the European Union: the present situation and future prospects  
(2002/2058(INI))

Draftsman: Patricia McKenna

### **PROCEDURE**

The Committee on the Environment, Public Health and Consumer Policy appointed Patricia McKenna draftsman at its meeting of 23 April 2002.

The committee considered the draft opinion at its meetings of 4 and 28 November 2002.

At the latter meeting it adopted the following conclusions by 27 votes to 10, with 1 abstention.

The following were present for the vote: Caroline F. Jackson, chairman; Mauro Nobilia, vice-chairman; Marie Anne Isler Béguin (replaced draftsman, Patricia McKenna); María del Pilar Ayuso González, Jean-Louis Bernié, Hans Blokland, David Robert Bowe, John Bowis, Chris Davies, Marialiese Flemming, Karl-Heinz Florenz, Françoise Grossetête, Jutta D. Haug (for Dorette Corbey), Bernd Lange, Peter Liese, Torben Lund, Jules Maaten, Minerva Melpomeni Malliori, Rosemarie Müller, Riitta Myller, Giuseppe Nisticò, Ria G.H.C. Oomen-Ruijten, Béatrice Patrie, Marit Paulsen, Frédérique Ries, Didier Rod (for Hiltrud Breyer), María Rodríguez Ramos (for Anne Ferreira), Dagmar Roth-Behrendt, Guido Sacconi, Karin Scheele, Inger Schörling, María Sornosa Martínez, Catherine Stihler, Robert William Sturdy (for Robert Goodwill), Astrid Thors, Kathleen Van Brempt, Peder Wachtmeister and Phillip Whitehead.

## CONCLUSIONS

The Committee on the Environment, Public Health and Consumer Policy calls on the Committee on Fisheries, as the committee responsible, to incorporate the following points in its motion for a resolution:

1. Considers that aquaculture affords opportunities which are supplementary and alternative to traditional fishing provided it can be ensured that the activity is conducted in accordance with the principles of sustainable use and can forestall to a sufficient extent the risk of adverse environmental impact, which may occur if the activity is conducted in unsuitable locations, is managed in contravention of current rules and regulations or operates on a scale which is not compatible with ecological balance in the area of water concerned.
2. Expresses its concern over discharges of unused nutritive salts from the activity, which in certain regions with unsuitable conditions or too extensive aquaculture cannot be converted by the natural ecosystems and may therefore contribute to eutrophication.
3. Is alarmed with the recent development of genetically modified salmon in North America. Any attempts to introduce genetically modified fish into the Community should be prevented until such time as it can be demonstrated to present no dangers for consumers or the environment. It is noteworthy that the Federation of European Aquaculture Producers (FEAP) has rejected the proposal to produce genetically modified fish.
4. Is concerned that salmon from fishfarms can affect natural fish populations, primarily genetically. Notes, however, that work is in progress to minimise the risk, which has also resulted in an appreciable reduction in the number of escaped fish.
5. Proposes that resources should be invested in research and development to develop, test and bring into operation possible alternative production methods, and to assess any global environmental impact they may have compared with traditional technology.
6. Considers that the positive trend in recent years towards reduced use of pharmaceuticals, chemicals and other artificial substances in aquaculture should be promoted and resources invested in the further prevention of diseases, securing favourable conditions for fish (reducing disease and the need to use substances for treatment) and developing alternative, environment-friendly substances for and methods of treatment.
7. Notes that only 35% of fishmeal is used for fish products, while the rest is used for other food production. Aquaculture should, however, endeavour to reduce dependence on fish oil and fishmeal and invest in developing alternative raw materials but without abandoning high quality feed standards. At the same time, due care should be taken to ensure that fishing for the raw materials used in aquaculture is carried out in a sustainable manner.

8. Notes that there are grounds for investigating how organochlorines such as PCBs, dioxins and furans appear in farmed fish, fish caught in the wild and other food, taking due account of the rules and action plans drawn up by the EU.
9. Recognises that certain types of intensive aquaculture may pose problems for animal health and welfare, particularly from over-crowding, and that new methods need to be found to provide more space for the fish.
10. Points out that predation on fish farms by marine mammals and/or seabirds occurs in some areas. Such problems should be dealt with by non-lethal means, including careful site selection and stronger cage construction.
11. Stresses that the future of fish farming lies in moving away from the intensive monoculture of finfish towards shellfish farming and integrated polyculture systems in which several species, primarily plants and non-carnivorous fish, are reared together in a more natural ecological relationship, avoiding the problems of the need for large quantities of food, the release of chemicals and other contaminants and the escape of fish into the wild.